

A new species of *Crocidura* from Nigeria (Mammalia: Insectivora)

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Introduction

During July and August 1978, Dr Andrew Demeter, Zoologist of the Hungarian Natural History Museum at Budapest, collected a large series of owl pellets in the Yankari Game Reserve in Northern Nigeria (see Demeter 1980 for details and a map of the reserve). The owl pellets contained skulls of about 120 Soricidae, which are now under study by the first author. Among them is a series of thirteen skulls of a remarkable new species of shrew, for which we propose the name

Crocidura yankariensis n. sp.

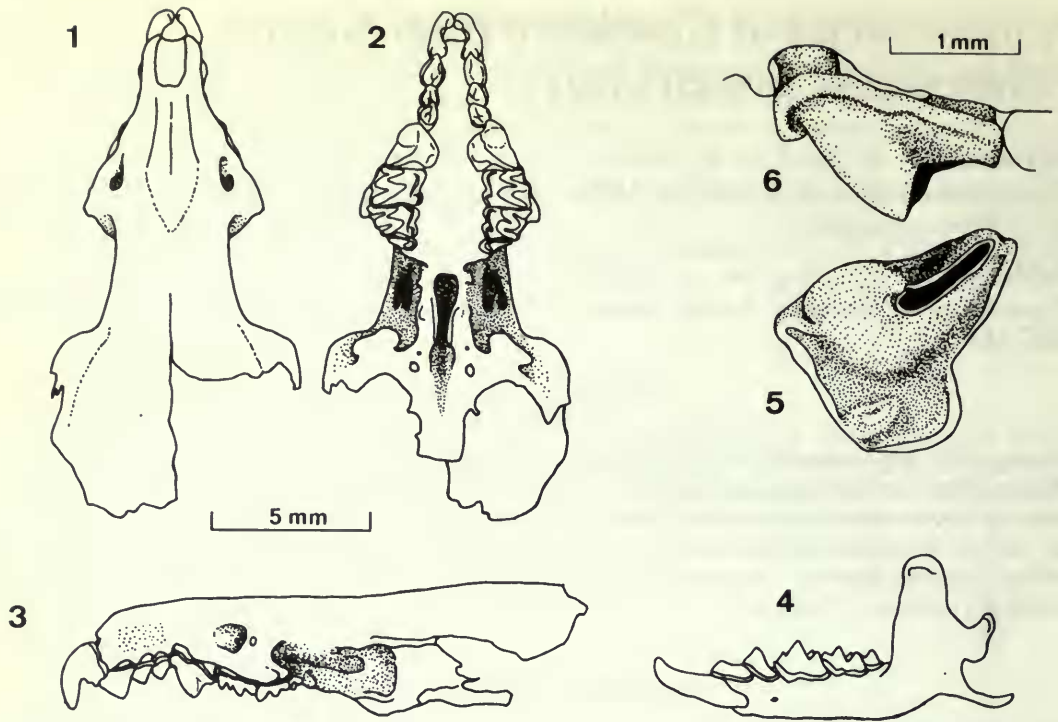
HOLOTYPE. Skull of a young adult specimen with occipital region missing, left and right mandibles present, removed from owl pellets collected by Andrew Demeter on 7 August 1978 at Futuk (9°50'N 10°55'E), 16 km E. of the Yankari Game Reserve boundary, Bauchi State, Nigeria; collectors number 32, holotype deposited in the Natural History Museum Budapest, No. HNHM 80.1.1.

PARATYPES. A further nine skulls from Futuk, all data as for the holotype, collectors numbers 30, 31, 33, 36, 44, 47, 51, 54, 55; three skulls from Wikki (9°45'N 10°30'E), a village in the center of the Yankari Game Reserve (see map in Demeter 1980), collected on 25 July and 11 August 1978 by Andrew Demeter; collectors numbers 67, 99, 100. Part of this material will be deposited in the British Museum (Natural History), London, and the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn.

DIAGNOSIS. A small shrew of the genus *Crocidura*, with condyloincisive length 18–19 mm, interorbital constriction fairly narrow, braincase broad, the superior articular facet with a markedly angular crest. The first and second upper incisors and the fourth upper premolar large and heavy, third lower molar minute. Parastyle of the fourth upper premolar absent, but cingulum well developed. First upper molar with a subsidiary cusp. Proto- and metaconid of the first lower molar united.

DESCRIPTION OF TYPE SERIES. Thirteen crania, three left and two right mandibles are available. Dental and cranial nomenclature follows Meester (1963), except for the mandibular dentition, for which nomenclature was adapted from Butler & Greenwood (1979).

Skull (Figs 1–3) General construction flat and broad. In the few skulls with intact braincases the breadth of braincase is about 45% of condyloincisive length. Dorsal surface slightly convex, forming a somewhat domed braincase. Superior articular facet of braincase with a well developed angular crest. Interorbital constriction long and narrow. Zygomatic process of the maxillary well developed, its posterior aligned with the middle of the second upper molar, rarely with junction between the first and second upper molars. Mandible without



Figs 1-6 Skull and dentition of *Crocidura yankariensis* n. sp., (1-3) paratype, no. 33, (4-6) holotype, no. 32, HNHM 80.1.1.; (1) dorsal view of skull, (2) ventral view of skull, (3) lateral view of skull, (4) lateral view of left mandibular ramus, (5) occlusal view of left P⁴, (6) labial view of left P⁴.

peculiarities, coronoid process rather high and broad, angular process slender. Mental foramen below the posterior edge of the fourth lower premolar (P₄).

Teeth (Figs 2-7). First upper incisor bifid, with a long anterior and a small posterior cusp (Fig. 3); the second incisor also large, twice as large as the following two small unicuspid teeth. The fourth upper premolar (P⁴) very robust particularly the large metacone (Figs 5, 6 & 7); the small parastyle is lacking but the cingulum is well developed and forms a small 'cusp' when viewed from the side; the lingual part of P⁴ extends far beyond a hypothetical line along the lingual edges of M¹, M² and M³. The first and second upper molars are also characteristic, a subsidiary cusp is present in the valley between the mesostyle, metacone and metastyle on the labial part of M¹, in a few specimens there are traces of such a cusp on M²; this small but distinct cusp is not visible on the worn teeth of old specimens. Three specimens (31, 33, 54) have a subsidiary cusp on ridge between paracone and mesostyle on labial part of M¹ and also on M² in No. 33. There are also indications of a metaconule between the protocone and hypocone of M¹ and M², as described by Heim de Balsac & Mein (1971) in a specimen of *Crocidura* sp. (group *dolichura*) from Thebes, Egypt. The third upper molar is small and simple.

Lower incisor smooth, with traces of denticulations only; lower premolars normal; the first lower molar is large and peculiar, since the proto- and metaconid are united and form nearly a joint cusp (Fig. 7d); in the second lower molar the proto- and metaconid are separated by a valley, as usual; the third lower molar is very small, its hypoconid has no fovea.

Fig. 7 *Crocidura yankariensis* n. sp., paratype, no. 55, dentition. (a) Left upper fourth premolar and molar series, (b) P⁴ (c) M¹ enlarged, note the subsidiary cusp on M¹, (d) first right lower molar M₁. Scanning electron photographs; scales are 1 mm.

a



b



c



d



MEASUREMENTS. See Table 1. Measurements of the type series were taken by Hutterer.

ETYMOLOGY. The specific name has been derived from the type locality, the Yankari Game Reserve.

DISTRIBUTION. *Crocidura yankariensis* is known only from Futuk (9°50'N 10°55'E) and Wikki (9°45'N 10°30'E), Northern Nigeria.

ECOLOGY. As will be demonstrated below, we assume that the new species is a savanna shrew. The Yankari Game Reserve covers a wide range of different vegetation types, ranging from tall swamp forests to open grassland (Geerling, 1980). The larger fauna of the Reserve is typical of West African savanna, and most of the shrews in the Yankari owl pellets are also savanna species, e.g. *Crocidura sericea arethusa* Dollman, 1915, *C. butleri* Thomas, 1911b, and others.

Table 1 Cranial and dental measurements (in millimetres) of *Crocidura yankariensis*

	Holotype	Type series		n
	HNHM 80.1.1.	Mean	Range	
Length of palate	7.9	7.74	7.2 - 8.0	10
Bimaxillary width	6.0	5.87	5.5 - 6.1	12
Least interorbital width	4.2	4.08	3.8 - 4.4	12
Greatest width	8.2	8.20	8.0 - 8.4	3
Length of upper toothrow	8.2	7.98	7.7 - 8.4	9
Lower toothrow length	7.6	7.63	7.5 - 7.8	3
I ² -I ² (external)	2.3	2.31	2.2 - 2.5	8
M ² -M ² (external)	5.5	5.36	5.0 - 5.7	10
Length of mandible	10.1	10.10	10.0-10.2	3
Height of coronoid process	4.6	4.80	4.6 - 5.0	3
P ⁴ Length	1.7	1.72	1.7 - 1.8	13
Breadth	1.8	1.76	1.6 - 1.8	13
M ¹ Length	1.5	1.51	1.4 - 1.6	12
Breadth	1.6	1.69	1.6 - 1.8	12

Discussion

COMPARISONS. Some characters of *Crocidura yankariensis* appear to be unique among recent African shrews. We have compared our specimens with the holotypes of *C. cinderella* Thomas, 1911a, *C. crossei* Thomas, 1895, *C. hildegardae rubecula* Dollman, 1915, *C. ingoldbyi* Heim de Balsac, 1956, *C. jacksoni denti* Dollman, 1915, *C. occidentalis picea* Sanderson, 1940, *C. occidentalis virgata* Sanderson, 1940, *C. pitmani* Barclay, 1932, *C. poensis attila* Dollman, 1915, *C. silacea* Thomas, 1895; with specimens of *C. bicolor* Bocage, 1889, *C. bottegi* Thomas, 1898, *C. dolichura* Peters, 1876, *C. douceti* Heim de Balsac, 1958, *C. floweri* Dollman, 1915, *C. gracilipes* Peters, 1870, *C. lusitania* Dollman, 1915, *C. planiceps* Heller, 1910 and *C. sericea arethusa* Dollman, 1915. For the following forms only descriptions were available to us: *C. bovei* Dobson, 1887, *C. foucauldi* Morales Agacino, 1943, *C. maquassiensis* Roberts, 1946, *C. malani* Lundholm, 1955, and the fossil *C. taungensis* Broom, 1948.

C. yankariensis is most similar in size and overall skull proportions to *C. cinderella*, *C. crossei*, *C. gracilipes* and *C. pitmani* (including *C. maquassiensis* and *C. malani*), while the other species may be discarded. None of the remaining four species has the superior articular facet of the braincase with a markedly angular crest, although some specimens of *C. gracilipes* are fairly angular; *C. crossei* is rounded, *C. cinderella* slightly angular, *C. pitmani* rounded; in *C. maquassiensis* this character has not been described by Roberts (1946),

Lundholm (1955) or Meester (1963). *C. pitmani*, *C. maquassiensis* and *C. malani* have a fovea on the hypoconid of M_3 , which is not present in *C. yankariensis*.

None of the recent forms that we have compared with *C. yankariensis* has a similarly robust P^4 ; the absence of the parastyle of P^4 is shared with the fossil *C. taungensis* (see Meester, 1955 for a drawing of the tooth), but the measurements that he gives of the teeth are smaller and the outlines of the teeth in a drawing by Broom (1948) do not correspond to *C. yankariensis*. Meester points out that in all living species of *Crocidura* the anterior cusp is quite well developed. This is correct in general but there are a few exceptions, for instance the holotype of *Crocidura petersii* Dobson, 1890a (see Dobson, 1890b, Plate 28, Fig. 17). The absence of the anterior cusp is constant in the type series of *C. yankariensis*, so may be regarded as typical for the species.

None of the recent species has a well defined subsidiary cusp on the first upper molar as in *C. yankariensis*. Nor do they have a first lower molar with the proto- and metaconid united.

RELATIONSHIPS. The limited material available to us allows few remarks on the possible relationships of the new species within the genus *Crocidura*. It is difficult to allocate *C. yankariensis* to a definite subgeneric group, because the external features are unknown. Judging from the skull, the general appearance of *C. yankariensis* is that of a savanna shrew, in terms of the flat and broad skull and the fairly narrow interorbital constriction, characters partly shared with *C. sericea* (Sundevall, 1843), *C. butleri* Thomas, 1911b, *C. hindei* Thomas, 1904, or *C. lamottei* Heim de Balsac, 1968. However, the ratio of interorbital breadth to maxillary breadth is higher in *C. yankariensis* than these species, which makes it similar to the *gracilipes* group.

The connection between the protocone and hypocone of the upper first and second molars resembles a case described by Heim de Balsac & Mein (1971) in a specimen of the *C. dolichura* species group. A connection between the protocone and hypocone of M^1 and M^2 is also present in the extinct genera *Heterosorex* and *Dinosorex*, members of the subfamily Heterosoricinae, consisting of miocene shrews of Europe and North America (see Engesser, 1975, Plate IV, Figs 1–3). The unique P^4 of *C. yankariensis* is most similar to the P^4 of *Heterosorex delphinensis* Gaillard, 1915 figured by Engesser (1975, Plate IV, Fig. 1) and also to a specimen of *Domnina gradata* Cope, 1873 figured by Repenning (1967, Fig. 3), both species belonging to the Heterosoricinae, a subfamily which is dissimilar to the recent Crocidurinae in several respects. It is also noteworthy that the closeness of the protoconid to the metaconid on M_1 is said by Repenning (1967) to be characteristic of the living crocidurines (subfamily Crocidurinae) and particularly of the extinct limnoecines (subfamily Limnoecinae). To our knowledge, this is generally not the case in *Crocidura*, where both cusps are separated by a valley; the M_1 of *C. yankariensis* with protoconid and metaconid distinctly close together is an exception among *Crocidura* and possibly an ancestral character, although it is difficult to evaluate characters at the present level of knowledge. New material and a better understanding of the whole genus is required to fix the exact position of *C. yankariensis*. At present it is wiser to avoid extended speculation.

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